ADAPTATION FUND

DATE OF RECEIPT:
ADAPTATION FUND PROJECT ID:
(For Adaptation Fund Board Secretariat Use Only)

PROJECT/PROGRAMME PROPOSAL

PART I: PROJECT/PROGRAMME INFORMATION

PROJECT/PROGRAMME CATEGORY:	Regular Project
COUNTRY/IES:	Pakistan
TITLE OF PROJECT/PROGRAMME:	Reducing Risks and Vulnerabilities from Glacier Lake Outburst Floods in Northern Pakistan
TYPE OF IMPLEMENTING ENTITY:	Multilateral Implementing Entity (MIE)
IMPLEMENTING ENTITY:	United Nations Development Programme (UNDP)
EXECUTING ENTITY/IES:	Ministry of Environment, Government of Pakistan
AMOUNT OF FINANCING REQUESTED:	US$ 3,906,000
Co-financing:	US$ 3,500,000.- (Government of Pakistan, in kind) US$ 500,000.- (UNDP)

BACKGROUND AND CONTEXT:

The Himalayan Karakorum Hindukush (HKH) mountain ranges in northern Pakistan possess the largest glaciers in the world outside the Polar Regions. This region plays an important role in global atmospheric circulation, biodiversity, water resources, and the hydrological cycle. It is the source of large river systems.

People living in the HKH region of northern Pakistan are annually affected by a number of climate-related hazards. These include floods, avalanches and landslides and result in extensive human and material losses. Climate change is projected to further exacerbate some of these natural hazards and lead to significant impacts on the regions' development.

Description of the Climate-Change-induced Problem

A major part of the snow and ice mass of the HKH region in Pakistan is concentrated in the watersheds of the Indus basin. As a result of rapidly changing climatic conditions, the glaciers in Pakistan are receding at a rate of almost 40 – 60 meters per decade. The melting ice from these glaciers is increasing the volume of water in the glacial lakes. According to the IPCC'S fourth assessment report, eleven of the last twelve years (1995 – 2006) rank among the 12 warmest years of in the history of global surface record since 1850. This rapid change in the world's temperatures is related with a faster rate of glacier melt.

Various studies suggest that the warming trend in the HKH region has been greater than the global average (ICIMOD, 2007). The most severe threat of this effect is related to the rapid melting of glaciers. As these glaciers retreat, glacial lakes start to form and rapidly fill up behind natural moraine or ice dams at the bottom or on top of these glaciers. The ice or sediment

bodies that contain the lakes can breach suddenly, leading to a discharge of huge volumes of water and debris. These are termed Glacier Lake Outburst Floods (GLOFs) and have the potential to release millions of cubic meters of water and debris, with peak flows as high as 15,000 cubic meters per second.

During a GLOF, the V-shaped canyons of a normally small mountain stream can suddenly develop into an extremely turbulent and fast-moving torrent, some 50 meters deep. On a floodplain, inundation becomes somewhat slower, spreading as much as 10 kilometers wide. Both scenarios present horrific threats to lives, livelihoods, infrastructure and economic assets for the exposed population. Mountain communities living in the proximity of glacier lakes and glacier fed rivers are particularly at risk, as they live in remote and marginalized areas and depend heavily on fragile eco-systems for their livelihoods.

According to a study conducted by ICIMOD (2007), 5218 glaciers (15040 sq km) and 2420 lakes were identified and mapped in Pakistan. Among the identified lakes, 52 lakes have been classified as potentially hazardous, and likely to cause GLOFs over the next few years to decades. The glaciers, glacial lakes and potentially GLOF-prone glacial lakes in the studied area of the Hindu Kush Himalaya Region are summarized in Figure 1 and Table 1.

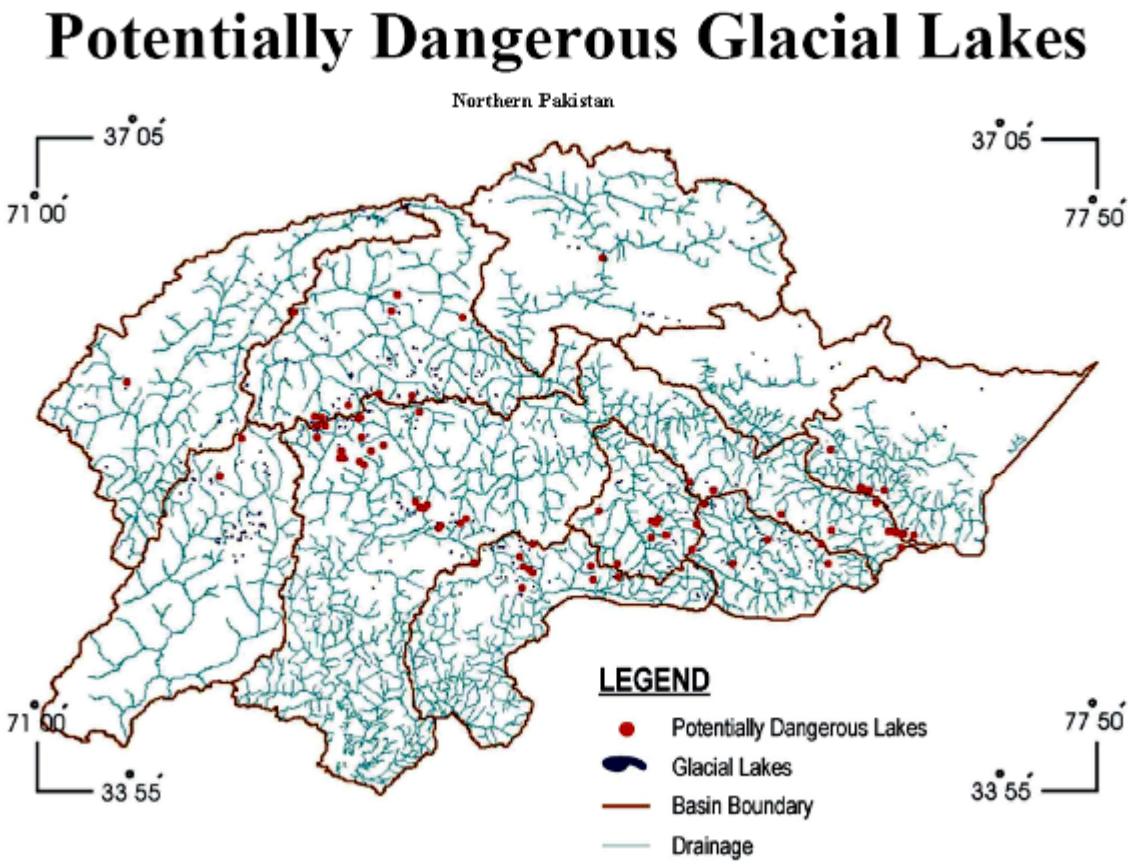


Figure 1: Potentially dangerous glacial lakes in Northern Pakistan (source: ICIMOD)

River Basins	Glaciers			Glacial Lakes		
	No.	Area (km^2)	Ice Reserve (km^3)	No.	Area (km^2)	Potentially dangerous
Indus River Basin						
Swat	233	223.55	12.221	255	15.86	2
Chitral	542	1903.67	258.817	187	9.36	1
Gilgit	585	968.1	83.345	614	39.17	8
Hunza	1050	4677.34	808.794	110	3.21	1
Shigar	194	2240.08	581.27	54	1.09	0
Shyok	372	3547.84	891.8	66	2.68	6
Indus	1098	688	46.38	574	26.06	15
Shingo	172	36.91	1.009	238	11.59	5
Astor	588	607.03	47.931	126	5.52	9
Jhelum	384	148.18	6.943	196	11.78	5
	5218	**15040.7**	**2738.51**	**2420**	**126.32**	**52**

Table 1: Potentially dangerous glacier lakes in the Indus River basin

Records show that on average, GLOF events occur in the Himalayas every 3-10 years, with varying degrees of socio-economic impact. From 1950 to 1999, recorded flood damages have amounted to property damage of Rs.380.181,- million, a death toll of 5,832 lives, and 84,475 affected villages. A total of 35 destructive outburst floods have been recorded in the Karakoram region in the past 200 years and at least 11 surges of exceptional scale have been recorded so far in the Upper Indus Basin.

Target area of the project

For this project, 2 hazardous glacier lakes in Gilgit-Baltistan and Chitral have been identified as target sites (see ANNEX IV): The **Bagrot valley** in Gilgit-Baltistan is considered at high risk of GLOF from the Bagrot Glacier. Bagrot valley covers an area of 452 $km^{2.}$ It is characterized by an extreme geomorphological relief, ranging from 1500 m up to 7788 m at the summit of Rakaposhi. Local agriculture relies on irrigation for growing crops. In Bagrot valley, the main valley glaciers are Hinarche, Burche, Gutumi, and Yune while several smaller cirque glaciers exist in the higher reaches. The glaciated area is about 42.3 $km^{2-}$and major part of the lower tongue is covered by supra-glacial debris, similar to the other glacier tongues in the valley. In greater Rakaposhi/Diran group, Hinarche Glacier can be considered representative of the valley glaciers with a strong vertical gradient in the accumulation zone, an extra debris cover on its tongue and a medium size area. In a first approximation, the melt water production for the entire valley results in about 300 million m^3 /year, which is still rather rough estimate, especially because the different supraglacial debris distribution of Burche Glacier needs to be mapped in greater detail. The valley has 1100 households with an estimated population of 10,000 people. Similarly, **Drongagh** has been selected as a demonstration site in Chitral. The village lies in the vicinity of Gohkir Glacier and has almost 500 households with a population of almost 3500 people and lies at a distance of approximately 40 kms from Chitral municipality. Both sites are highly vulnerable to flooding related to glacial lake outbursts or glacial outbursts, which occur almost every year. The floods do not only result in damages to community infrastructure, communication networks, roads and crops, but also cause human casualties.

Type of lake	Lake no.	Area (km2)	Associated glacier	Distance to glacier	Remarks
End Moraine	Chitr_gl61	0.05	Chitr_gr108	-	In contact with mountain glacier
End Moraine	Gil_gl550	0.10	Gil_gr191	464	Followed by large glacier source
End Moraine	Gil_gl590	0.19	Gil_gr366	-	In contact with large hanging glacier
End Moraine	Gil_gl505	0.21	Gil_gr79	820	Massive hanging glacier source
End Moraine	Gil_gl336	0.21	Gil_gr22	225	Near to hanging glacier source
End Moraine	Gil_gl469	0.27	-	375	Near massive mountain glacier
End Moraine	Gil_gl399	0.73	Gil_gr28	-	In contact with hanging glaciers
Valley	Gil_gl589	0.20	-	412	Near several hanging glaciers
Valley	Gil_gl611	0.29	-	159	Near several hanging glaciers

Table 2: Potentially dangerous glacier lakes in the target area of the project (ICIMOD, 2010)

Barriers in Responding to the Climate Change-induced Problem

Accurate and comprehensive knowledge of glaciers and glacial lakes are of utmost importance to understand and manage the risk of GLOFs in northern Pakistan. At present, the country faces a critical gap in *knowledge* of hydrological forecasting, risk mapping and disaster prevention planning. The information currently available about the glaciers in the water shed of the Indus basin is limited and scattered, and the understanding of the snow and ice conditions associated with the mountainous headwater of the Indus is largely inadequate.

As the current status of the identified glacial lakes is changing, the number of potentially hazardous lakes and their location/origin is shifting, and new lakes are developing rapidly, a need has developed for a formal monitoring and evaluation system to validate the information on the status of potentially hazardous glacial lakes. A digital repository is be required to consolidate the existing knowledge on glaciers, glacial lakes, and GLOF events, which will enhance the ability of policy makers to understand the associated vulnerabilities and finance/implement appropriate risk mitigation and disaster preparedness measures.

Current (baseline) disaster management policies and risk reduction and preparedness plans in Pakistan address recurrent natural hazards (e.g.flooding, landslides and seismic events) in the country, but are not yet geared to deal with the new dimension of GLOF threats. Due to the limited information on the expected distribution and the impacts of GLOFs, there are capacity deficits in existing *early warning* systems. According to the United Nations International Strategy for Disaster Reduction (UNISDR) defines early warning system, as “the provision of timely and effective information through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risks and prepare for effective response (2006). Current disaster mitigation and preparedness initiatives (including early warning systems) do not have the capacity to manage effectively the risks posed by rising water levels in glacial lakes, including issuing early warning of GLOFs.

Communities settling in GLOF-prone mountain valleys are highly vulnerable, with vulnerabilities being compounded by poverty, increasing pressure on natural resources, high-risk settlement patterns, and the need for greater education and public *awareness* on how to reduce risk from GLOF threats. Resources from the Adaptation Fund will therefore be required to ensure local

community *participation* in GLOF risk management and disaster prevention activities, and to create an enabling institutional environment at all levels of policy making, investment and communications planning to support community-based implementation of targeted risk reduction activities.As there is a need for the capacity enhancement of the communities so that a community based monitoring system is established;,the project will involve the community members in the committees dealing with infrastructure, conservation of natural resources, operations and management of project activities.This will have a positive effect not only on communal resilience, but will also be helpful in connecting isolated target communities to broader economic and social development benefits.

PROJECT / PROGRAMME OBJECTIVES:

The proposed project will reduce risks and vulnerabilities from GLOFs and snow-melt flash floods in Northern Pakistan. The main objectives of the project are as follows:

- To develop the human and technical capacity of public institutions to understand and address immediate GLOF risks for vulnerable communities in Northern Pakistan
- To enable vulnerable local communities in northern areas of Pakistan to better understand and respond to GLOF risks and thereby adapt to growing climate change pressures

PROJECT / PROGRAMME COMPONENTS AND FINANCING:

PROJECT COMPONENTS	EXPECTED CONCRETE OUTPUTS	EXPECTED OUTCOMES	AMOUNT (US$)
1. Policy recommendations & institutional strengthening to prevent climate change induced GLOF events in northern Pakistan	1.1. Policy framework and guidelines to address GLOF risks in northern Pakistan institutionalized 1.2. Indicators and criteria for GLOF vulnerability developed and systematically applied to enable priority allocation of risk reduction efforts and investments	1. Strengthened Institutional capacities to implement policies, plans and investments that prevent human and material losses from GLOF events in vulnerable areas of Northern Pakistan	100,000
2. Strengthening Knowledge and Information about GLOF risks in northern Pakistan	2.1. Systematic engagement with global and regional research networks and centers working on GLOF issues 2.2. Risk and hazard maps for mountain valleys with the highest GLOF risk and exposure of lives, livelihoods and infrastructure	2. Improved access of disaster management planners and policy makers to knowledge, information and research on GLOF risks	250,000

3. Demonstration of community-based GLOF risk management in vulnerable mountain valleys of northern Pakistan	3.1. Preparedness actions for vulnerable communities conducted to reduce risks from GLOF events 3.2. A community based system for GLOF risk monitoring & early warning established in priority communities 3.3. Targeted GLOF risk reduction measures such as check dams, spill-ways, slope stabilization or controlled drainage established in Bagrot and Drongagh valleys	3. Reduced human and material losses in vulnerable communities in the Northern areas of Pakistan through GLOF early warnings and other adaptation measures	2,790,000
4. Documentation, analysis and continued application of lessons learnt	4.1. Technical knowledge and project lessons documented for use in future initiatives 4.2. Project experiences disseminated to policy makers and disaster management planners in Pakistan and the wider HKH region	4. Project experiences documented and replicated	100,000
4. Project/Programme Execution cost			360,000
5. Total Project/Programme Cost			3,600,000
6. Project Cycle Management Fee charged by the Implementing Entity [1]			306,000
Amount of Financing Requested			**3,906,000**
Co-financing by Government of Pakistan			3,500,000
Co-financing by UNDP			500,000

PROJECTED CALENDAR:

MILESTONES	EXPECTED DATES
Submission of Concept to AF	April 26, 2010
Approval of the Concept by the AF Board	June 15, 2010
Development of a Full Project Proposal	June-October 2010
Submission to AF of a Full Project Proposal	October 2010
Start of Project/Programme Implementation	July 2011
Mid-term Review (if planned)	July 2014
Project Closing	June 2015
Terminal Evaluation	March 2015

[1] *On the request of the Government of Pakistan, the project will be implemented by UNDP using the MIE modality. UNDP is able to provide the following implementation services through its country office, regional and headquarters networks: project identification, formulation, and appraisal; determination of execution modality and local capacity assessment of the national executing entity; briefing and de-briefing of project staff; oversight and monitoring of AF funds, including participation in project reviews; receipt, allocation and reporting to the AF Board of financial resources; thematic and technical capacity building and backstopping; support with knowledge transfer; policy advisory services; technical and quality assurance; and troubleshooting assistance to the national project staff. Further details on the types of specialized technical support services which may be provided are articulated in the table provided to the AFB Secretariat on 14 May 2010 (see Annex V).*

PART II: PROJECT JUSTIFICATION

A. DESCRIBE THE **PROJECT COMPONENTS**, PARTICULARLY FOCUSING ON THE CONCRETE ADAPTATION ACTIVITIES OF THE PROJECT, AND HOW THESE ACTIVITIES CONTRIBUTE TO CLIMATE RESILIENCE.

The project will help by reducing climate change induced risks and vulnerabilities from GLOFs in the Northern Areas of Pakistan by encouraging community based adaptation measures for climate change induced GLOFs. The components of the project are described below.

Component 1: Policy recommendations & institutional strengthening to prevent climate change induced GLOF events in northern Pakistan

This project component responds to the need for systematic integration of GLOF risk management into the processes, policies and plans of institutions that have a stake in avoiding human and material losses from GLOF events in vulnerable areas of northern Pakistan. Project inputs will be utilized to develop the capabilities of local level institutions (Agriculture, Livestock and Forest departments of Gilgit Baltistan and Chitral) and federal level institutions (Ministry of Kashmir Affairs and Gilgit Baltistan, Ministry of Environment and National Disaster Management Authority) to understand the nature and extent of GLOF risks in Pakistan, and their effects on human and economic development in all sectors. Targeted, evidence-based policy recommendations on GLOF prevention and risk management will be prepared and disseminated for adoption at national and provincial levels, which will enable the integration of GLOF risk awareness in all potentially affected sectors. Contingency plans & incentive schemes to address GLOF risks at the policy level will be developed, based on collaboration between affected stakeholders.

Component 1 will encompass the following Outputs and indicative activities:

Output 1.1: Policy framework and guidelines to address GLOF risks in northern Pakistan institutionalized.

Indicative activities under Output 1.1 will include:

1.1.1. Establish an inter-agencies working group to incorporate climate change risk management considerations into existing disaster management policy frameworks and new legislation

1.1.2. Revise the existing National Disaster Risk Management plan to incorporate climate risk and GLOF issues and submit for endorsement by NDMA.

1.1.3. Develop and institutionalize comprehensive GLOF risk management guidelines at the district and community level especially which are vulnerable to GLOF

Output 1.2: Indicators and criteria for GLOF vulnerability developed and systematically applied to enable priority allocation of risk reduction efforts and investment.

Indicative activities under Output 1.2 will include:

1.2.1 Establish a central database that captures flood and GLOF risk indicators, building

on analysis conducted under Output 2.2

1.2.2 Train Gilgit-Baltistan and Chitral Disaster Management Authorities, National Disaster Management Authority, and Forest Department in accessing the GLOF risk database and interpret the information available to support policy, planning and investment decisions

1.2.3 Develop and implement a capacity building roadmap for national, provincial and district level authorities to integrate GLOF risk considerations into national, provincial and district development planning.

Component 2: Strengthening Knowledge and Information about GLOF risks in northern Pakistan

This project component addresses the need for more accurate and comprehensive knowledge of glacier lakes and their associated flooding risks in northern Pakistan. Such knowledge is essential for better risk mapping, early warning and disaster prevention planning. Based on a targeted mapping exercise of flooding hazards downstream of potentially hazardous glacier lakes, a locally anchored knowledge base & analytical framework for long-term tracking & management of GLOF risks will be developed. Systematic networking and exchanges with global & regional research institutions and resource centers, as well as with other GLOF risk management projects in the region (e.g. the Least Developed Country Fund (LDCF) GLOF risk reduction project in the Punakha-Wangdi and Chamkhar Valleys of Bhutan) will contribute to a widening the knowledge base about GLOF risks in Pakistan, eventually leading to a critical mass of knowledge required for specific and targeted risk reduction investments. Existing indigenous knowledge, cultural beliefs and coping mechanisms to address flooding risks in Northern Pakistan will be documented and factored into the risk reduction and preparedness activities employed by this project.

Component 2 will encompass the following Outputs and indicative activities:

Output 2.1: Systematic engagement with global and regional research networks and centres working on GLOF issues.

Indicative activities under Output 2.1 will include:

2.1.1 Establish cooperative links between national and provincial disaster management authorities specialized research organizations like GCISC and ICIMOD to take stock of available knowledge on glacial melt effects and associated flooding patterns in the Himalaya-Hindukush region

2.1.2. Capture lessons from other GLOF projects in Bhutan, Nepal, China, India, Peru, Chile and European countries to define a catalogue of available know-how and technologies for GLOF risk reduction.

Output 2.2: Risk and hazard maps for mountain valleys with the highest GLOF risk and exposure of lives, livelihoods and infrastructure

Indicative activities under Output 2.2 will include:

2.2.1 Acquire remote sensing and GIS data of all mountain valleys in Pakistan which have a potential GLOF risk

2.2.2 Prepare detailed risk and hazard zonation maps for all mountain valleys with the highest GLOF risks

2.2.3 Undertake consultations with community members and other stakeholders in Bagrot and Drongagh to assess vulnerabilities in communal risk hot spots, as well as existing technical, natural, human and social capital that can be employed to reduce disaster risk

2.2.4 Prepare detailed GLOF vulnerability maps (combining hazard exposure and livelihood sensitivity) for the project target sites of Bagrot and Drongagh

Component 3: Demonstration of community-based GLOF risk management in vulnerable mountain valleys of northern Pakistan

Adaptation Fund resources will be used to demonstrate GLOF risk management at the village and district levels, with the aim to provide an evidence base for replication and up-scaling. Based on the systematic capturing of hazard information and vulnerabilities in Component 2, awareness raising activities will be undertaken to educate disaster-prone communities about the nature of GLOF risks, the particular behavior of GLOF events, evacuation routes and appropriate early warning and risk reduction measures. These awareness activities will be connected with the production and dissemination of communication products, such as posters, leaflets and videos illustrating the topic. Institutional arrangements to devise, operate, test, and maintain a community-based GLOF risk monitoring & early warning system will be established in a at least 2 high-risk target communities, providing an evidence base on the strengths and weaknesses of different types of high- and low-tech early warning systems. Based on such analyses, a prototype GLOF Early Warning system will be devised for replication in other vulnerable areas. In addition to the demonstration of an Early Warning system, the project will demonstrate targeted GLOF risk mitigation measures for at least 2 communities which are located in high-risk sites.

Vulnerability analysis on the basis of GLOF hazard exposure and sensitivity mapping has been considered a critical feature for the selection of target communities to participate in and benefit from this project. The target areas have been selected on the basis of the following criteria:

1. Technical geography:

   The target demonstration site are representative with respect to their geographical location, area and height of glaciers, track of glacier lakes, hydrology, direction of sloping land surface, disintegrating ice and/or sediment barriers, geological structure and build-up, size of affected communities, and their general vulnerability profile. The geographical locations and other related features of the glaciers and lakes will be captured and analyzed by means of a Geographical Information System (GIS) under Component 2 of the project.

2. Recurring GLOF Events / History:

   Recurring GLOF events have been identified through a time series analysis, using existing maps, satellite data and other records available from different years.

3. Affected communities and accessibility of the area:

   Considerations have included: The size of the community under consideration, the number of persons exposed to flooding risk; population density, traditions/culture of the community, present land use, accessibility and livelihood structure, awareness level of community about the possible impacts of GLOF.

Based on verification of the above criteria with local stakeholders, two potentially hazardous glacier lakes in Gilgit-Baltistan and Chitral have been identified as target sites for the project: The **Bagrot valley** in Giltgit-Baltistan is considered at high risk of GLOF from the Bagrot Glacier. Bagrot valley covers an area of 452 $km^{2.}$ It is characterized by an extreme geomorphological relief, ranging from 1500 m up to 7788 m at the summit of Rakaposhi. Local agriculture relies on irrigation for growing crops. In Bagrot valley, the main valley glaciers are Hinarche, Burche, Gutumi, and Yune while several smaller cirque glaciers exist in the higher reaches. The glaciated area is about 42.3 $km^{2.}$ and major part of the lower tongue is covered by supra-glacial debris, similar to the other glacier tongues in the valley. In greater Rakaposhi/Diran group, Hinarche Glacier can be considered representative of the valley glaciers with a strong vertical gradient in the accumulation zone, an extra debris cover on its tongue and a medium size area. In a first approximation, the melt water production for the entire valley results in about 300 million m^3 /year, which is still rather rough estimate, especially because the different supraglacial debris distribution of Burche Glacier needs to be mapped in greater detail. The valley has 1100 households with an estimated population of 10,000 people. Similarly, **Drongagh** has been selected as a demonstration site in Chitral. The village lies in the vicinity of Gohkir Glacier. has almost 500 households with a population of almost 3500 people and lies at a distance of approximately 40 kms from Chitral municipality. Both sites are highly vulnerable to flooding related to glacial lake outbursts or glacial outbursts, which occur almost every year. The floods do not only result in damages to community infrastructure, communication networks, roads and crops, but also cause human casualties.

Technical considerations for the design of an Early Warning System (EWS):

Existing flood early warning systems in the 2 target sites of Bagrot Valley and Drongagh will be established to enable the dissemination of flashflood warning signals on a 24 hour basis. EWS design is expected to involve:

i) Threat detection (sensor), relay and warning stations;
ii) GLOF watchadvisories issued by Pakistan metrological department (PMD) to communities at risk via print and electronic media
iii) Establishment of an SMS messaging system to communicate warning signals to community based organizations,local NGOs and Government departments;,
iv) Establishment of a central voice response system where end users may get flood risk information via phone/mobile call around the clock;
v) Early warning awareness and training workshops for community, NGOs, government and media representatives to ensure that EWS procedures are internalized;
vi) Real-time mock drills at community level to simulate a GLOF disaster and verify functionality of the EWS

Selected community and NGO members will be trained in the calibration, operation and maintenance of sensor equipment installed by PMD at the target sites.

Technical considerations for the design of community-based GLOF risk mitigation measures:

Potential outburst flood hazards can be alleviated by various techniques. The primary objective is to reduce the risk of a flood from the lake. However, coordinated measures to protect life and property in the downstream area must also be undertaken, hence the importance to combine these techniques with EWS-based mechanisms downstream. The most common structural mitigation measures are aimed at reducing the volume of water in the lake. Reduction of the volume of water in the lake should reduce the potential peak surge discharge as well as the hydrostatic pressure exerted on the moraine dam, and is the most effective mitigation measure. There are different ways to achieve this that can be used alone or in combination:

1. Controlled breaching of the moraine dam
2. Construction of an outlet control structure
3. Pumping or siphoning the water from the lake
4. Tunnelling through the moraine barrier or under an ice dam

Mitigation measures must be brought into play in such a way that no unintentional increase in danger occurs. Since moraine dam stability is a major part of the problem, it follows that artificial disturbance of the dam itself during construction activity could actually increase the degree of danger while mitigation measures are being put into place. Thus, choice of an appropriate method for each individual lake is critical. Physical monitoring systems for the dam, lake, glacier, and surroundings are necessary at all stages of the mitigation process.

In addition to reducing the volume of lake water, there are other preventative measures around the area that can help reduce the likelihood, or impact of, a GLOF. These include removing masses of unstable rocks to guard against avalanches or rockfalls hitting the lake surface and causing a surge wave, and protecting infrastructure in the downstream area. Other measures include check-dams, mini dams, spill-ways, slope stabilization and -reinforcement. Check dams are helpful in reducing the flow of water coming down by gravity flow and conserving soil and thus provide downstream protective measures. Removing or restraining trigger mechanisms include stabilization of adjacent slopes. Slope stabilization may be through vegetation or engineering structures.

In all structural mitigation measures undertaken by the project, experience from other GLOF risk reduction projects (including GLOF risk reduction projects in India, China, Nepal and Bhutan) will be integrated and adopted where appropriate.

Component 3 will encompass the following Outputs and indicative activities:

Output 3.1: Preparedness actions for vulnerable communities conducted to reduce risks from GLOF events

Indicative activities under Output 3.1 will include:

3.1.1 Disseminate climate watch advisories issued by the Pakistan Meteorological Department to end users/farmers at grass-root level in Bagrot and Drongagh

3.1.2 Organize workshops and seminars for district and local level authorities in Bagrot

and Drongagh on GLOF preparedness and risk reduction measures

3.1.3 Undertake awareness raising activities forl communities in Bagrot and Drongagh, including posters andbrochures in local language, radio programmes, local consultations and newspaper articles

3.1.4 Incorporate specific awareness activities for women and vulnerable groups (children, elderly, disabled) into all communication activities to reduce disproportional vulnerabilities and ensure inclusivity of the measures.

Output 3.2: A community based system for GLOF risk monitoring and early warning established in priority communities

Indicative activities under Output 3.2 will include:

3.2.1 Establish an early warning communication network of local NGOs and government departments, using different communication links such as telephone trees, SMS and e-mail networks

3.2.2 Establish a centralized early warning and response desk which registers and relays warning messages on a full-time basis via telephone

3.2.3 Design and install technical elements of a fully functional EWS, including hazard sensors, relay stations and warning signal installations and a low-tech backup system to buffer technology-related risks.

3.2.4. Train staff for the operation and maintenance of the EWS and conduct at least one real-time GLOF mock drill per year to test functionality of the EWS and effect adjustments where needed

Output 3.3: Targeted GLOF risk reduction measures such as check dams, spill ways, slope stabilization or controlled drainage established in Bagrot and Drmgrah valleys.

Indicative activities under Output 3.3 will include:

3.3.1 Establish criteria for the potential GLOF risk reduction measures in consultation with GCISC, district and local level authorities and community members, based on analysis conducted under Output 2.2

3.3.2 Engage technical experts to determine the most appropriate GLOF risk reduction measures at the two target sites

3.3.3 Engage local communities in the installation of GLOF risk reduction measures at both target sites

3.3.4 Construct appropriate GLOF risk reduction measures with the help of local community members, employing volunteer action as well as cash-for-work components where appropriate.

Component 4: Documentation, analysis and continued application of lessons learnt

Building on participative processes initiated under Components 1 and 2 of the project, and drawing on the technical experiences in the establishment of early warning and risk mitigation measures under Component 3, Component 4 of the proposed project will introduce targeted activities to enable the analysis, replication and upscaling of the project approach in other communities who are vulnerable to GLOF risks. This will entail a campaign to present the findings from the project to different public entities and development partners, as well as other district entities with similar degrees of vulnerability. This campaign will integrate all vulnerable districts (based on the vulnerability maps generated under Outputs 1.2. and 2.2.) and aim at the replication of the project approach in at least 3 other vulnerable areas. Exchange programmes to the target sites will be facilitated to promote learning and transfer of experience (especially with regards to the design of coupled EWS that covers as many vulnerable mountain valleys as possible).

By taking a systematic approach to the codification, analysis and dissemination of knowledge about GLOF risks and how they can be addressed, the project will allow replication of effective risk reduction measures for GLOF both within Pakistan and beyond. This systematic management will assist the replication of early warning systems and targeted risk mitigation measures in other GLOF prone areas in northern Pakistan. Other countries facing GLOF risks, such as China, India, Nepal and Bhutan, will also benefit from the knowledge generated through the project. This proposed initiative will contribute to a critical mass of experience on GLOF risks in the Himalaya region and enhance systematic regional cooperation on this critical adaptation issue.

Output 4.1: Technical knowledge and project lessons documented for use in future initiatives

Indicative activities under Output 4.1 will include:

4.1.1 Document all technical specifications and decision-making processes pertaining to the establishment of early warning and risk mitigation systems under the project

4.1.2 Draft a manual on the GLOF risk reduction based on the lessons learnt from the project

4.1.3 Establish a website for documenting project activities and Lessons learned, and connect this website with the GLOF risk database established under Component 1

Output 4.2: Project experiences disseminated to policy makers and disaster management planners in Pakistan and wider HKH region.

Indicative activities under Output 4.2 will include:

4.2.1 Organize at least two workshops for national, provincial and district level authorities to disseminate project experiences

4.2.2 Organize site visits and community consultations for district authorities, NGOs and CBOs in other GLOF-prone areas

4.2.3 Broadcast the project on national and international radio and television programmes

4.2.4. Conduct at least one study visit to another GLOF risk reduction project in the HKH region to ensure south-south transfer of technical know-how and experience

B. DESCRIBE HOW THE PROJECT PROVIDES **ECONOMIC, SOCIAL AND ENVIRONMENTAL BENEFITS**, WITH PARTICULAR REFERENCE TO THE MOST VULNERABLE COMMUNITIES.

The socio-economic impacts of GLOF events in the Hindu-Kush and Himalayas are significant, as demonstrated by historic GLOF events. The geomorphologists of the International Karakoram project surveyed the Hunza valley between Gilgit and Gulmit along the Karakoram Highway in 1980 and identifed traces of 339 disastrous incidents including a wide range of short lived mass movements. Among these hazards, the most destructive ones are related to movements of glaciers, in particular when glacier advance/retreat is leading to outburst of glacial lakes damaging and burying cultivated lands, irrigation systems and infrastructure downstream. Generally, detailed information on specific GLOF events is limited. Thirty-five destructive outburst floods are recorded in the Karakoram region in the past two hundred years..

The proposed project has selected the target sites of Bagrot and Drongagh, which are highly vulnerable to recurrent flooding events and located in the pathway of potentially hazardous glacier lakes on the Bagrot and Gohkir glaciers. Within these target sites, the project will directly benefit 1600 households and 15,000 people, which have experienced flooding - related human and material losses in the past. The GLOF vulnerability assessment conducted under Output 2.2 will be founded in comprehensive consultations with community members in Bagrot and Drongagh to assess the existing exposure of all households and describe the current dispersion of technical, natural, human and social capital in the target communities. This will ensure that the most vulnerable groups in the most exposed locations receive the most benefits out of this project.

An additional social benefit of the project is the capacity it creates in non-governmental and community-based organisations. In the process of achieving enhanced disaster preparedness, community members and community-based organizations will be enabled to improve their communication and outreach activities, and engage with GLOF early warning systems in important relay functions.

Project measures will have a positive effect not only on the environmental conditions in the area, e.g. by conserving existing forested slopes and maintaining the natural state of natural flooding buffers along riverbanks and floodplains, but will also be helpful in connecting isolated communities to initiatives which will ultimately provide potential for income generation (such as community-based management of drainage channels, which could be one particular mitigation activity supported and financed by the project). This will contribute to broader economic and social development benefits for local communities in the area. At the policy level, the project will provide an enabling environment for the integration of climate change adaptation and risk management considerations into GLOF-affected sectors, such as land use planning, agriculture, forestry and disaster management. The interface between the policy level and local level institutions will be enhanced, in order to ensure evidence-based policy making that is informed by community needs. Involvement of communities from the planning and design to the implementation and monitoring stages of project will further enhance the economic and social benefits of the project, and ensure that communities are empowered to be in charge of their own protection from climate-induced risks.

C. DESCRIBE OR PROVIDE AN ANALYSIS OF THE **COST-EFFECTIVENESS** OF THE PROPOSED PROJECT

Records show that on average, GLOF events occur in the Himalayas every 3-10 years, with varying degrees of socio-economic impact. From 1950 to 1999, recorded flood damages in Pakistan have amounted to property damage of Rs.380.181,- million, a death toll of 5,832 lives, and 84,475 affected villages. A total of 35 destructive outburst floods have been recorded in the Karakoram region in the past 200 years and at least 11 surges of exceptional scale have been recorded so far in the Upper Indus Basin.

With regards to assessing which course of action is most suitable and cost-effective to prevent such losses, a joint study by ICIMOD, ISDR and GFDRR ("Formation of Glacial Lakes in the Hindu Kush-Himalayas and GLOF Risk Assessment"[2] from 2010 provides clear indication that the set of adaptation measures proposed under this project does not have a justifiable alternative in terms of achievable vulnerability reduction and adaptive capacity. The study considers GLOF Early Warning systems as an essential part of disaster preparedness that has excellent potential to greatly reduce loss of life and property. Alternative options to EWS-based approaches, such as the retrofitting of critical infrastructure, would ultimately imply much higher investments. For the analysis of GLOF hazards, the project will apply remote sensing technology, which is considered asthe most effective first phase approach in GLOF risk reduction and preparedness. Remote sensing under this project will facilitate rapid and complete coverage of large and extremely remote mountainous areas, thus allowing potentially dangerous localities to be pin-pointed for closer inspection. This is important because the total area of such localities will be a small percentage of the entire region under initial survey. In this manner, time and expenses are reduced. Overall, the project's three-pronged hazard analysis, risk reduction and capacity building approach has a better cost-benefit ratio than the scaling up of disaster response and Search & Rescue systems in Pakistan.

The project will utilize existing national institutions, NGOs and Community Based Organizaions (CBOs) developed under the Aga Khan Rural Support Programme (AKRSP) which will reduce transaction costs. AKRSP has a long time presence on the ground in Northern Pakistan and it has established community organizations that have become self sustaining in many parts. The project will make use of these already established forums.

At the operational level, cost effectiveness of the project concept is reflected through the following characteristics:

1) Throughout the project, AF resources will be aligned with the financing and delivery of project outputs that have competitive procurement components to ensure best value for money;
2) The project has made a successful effort to increase the co-financing portion of the project, which diversifies financial risks and increases financial flexibility.
3) A number of project activities will involve local communities and connect directly to local opportunities for the purchase of goods and services.

[2] http://www.unisdr.org/preventionweb/files/14048_ICIMODGLOF.pdf

D. DESCRIBE HOW THE PROJECT IS CONSISTENT WITH **NATIONAL OR SUB-NATIONAL SUSTAINABLE DEVELOPMENT STRATEGIES**, INCLUDING, WHERE APPROPRIATE, NATIONAL OR SUB-NATIONAL DEVELOPMENT PLANS, POVERTY REDUCTION STRATEGIES, NATIONAL COMMUNICATIONS, OR NATIONAL ADAPTATION PROGRAMS OF ACTION, OR OTHER RELEVANT INSTRUMENTS, WHERE THEY EXIST.

Addressing the risks and vulnerabilities from climate change induced hazards is considered a high-priority under Pakistan's National Environment Policy (2005), the second Poverty Reduction Strategy Paper (PRSP-II), as well as provincial sustainable development strategies and district development plans. Pakistan's Initial National Communication to the UNFCCC (2003) highlights that a detailed meso-scale atmospheric model and a regional hydrological model for the upper Indus basin are required to accurately quantify the long term effects of increased temperatures on the melting of glaciers and behavior of the westerlies in a hotter climate. Such data would be invaluable when future water management strategies are being planned, and would be useful in the prediction of floods that also include Glacier Lake Outburst Floods. That said, without the availability of additional risk and vulnerability information in relation to rapidly growing glacier lakes (such as proposed under Components 1 and 2 of this project), it is not possible to address this dimension of risk in national policies. It is hoped that as the threat of glacier lake outburst floods and other associated occurrences (e.g. Hunza lake formation), are becoming better understood (e.g. by building on the hazard and vulnerability assessments proposed by this project), policy documents such as the second and third National Communications will be more explicitly referring to the very real and rapidly growing threat of Glacier Lake Outburst Floods.

At this point, it is critical to note that the National Disaster Management Framework of Pakistan, which was developed by the National Disaster Management Authority (2007)makes explicit reference to GLOF risk issues and the necessity to address them. In addition, the Task Force on Climate Change (TFCC) installed by the Planning Commission has highlighted GLOF issues in Gilgit-Baltistan as one of the key vulnerabilities and consequently included it in its final report (2010)

The DIPECHO/UNDP-funded Regional Climate Risk Reduction Project that was initiated in four countries (Pakistan, India, Bhutan and Nepal) in 2008 started recognizing the importance of risks posed by GLOF and the inadequate attention it has received amongst governments / communities and development actors. The project has focused mostly on the Gulkin and Passu glaciers, adopting community based risk reduction approaches to better prepare vulnerable communities. Low-tech early warning systems have been established in a number of sites, which are operated manually. In addition, the project has completed a needs assessment on the impacts of GLOF events in the Hunza River Basin. Community members from Gulkin, Passu and Hussaini villages have been trained in disaster risk reduction and first aid, which provides some relevant experiences the proposed project will draw on.

E. DESCRIBE HOW THE PROJECT / PROGRAMME MEETS RELEVANT NATIONAL **TECHNICAL STANDARDS,** WHERE APPLICABLE.

There are national technical standards and guidelines which are applied when new projects are implemented. The provincial Environmental Protection agencies monitor the implementation of these guidelines. The guidelines for **Environmental Impact Assessment** have been devised for any infrastructure and land use planning projects, and will be applied throughout this project. Other environmental standards such as **National Environment Quality standards** have also been devised and will be applied by provincial and district authorities in connection with this

project. **GIS and Remote Sensing** is extensively used in the development and planning projects in Northern Pakistan. National institutions such as SUPARCO are acquainted with the latest technical standards in relation to satellite imagery and GIS mapping. These standards will be applied under the proposed project. Technical guidelines are available in order to utilize satellite imagery and GIS maps for planning purposes.

In connection with technical standards, it is worth highlighting that the proposed AF project will be the first project with a focus on GLOF risk reduction that will be implemented at the national level. Presently, there are no guidelines or technical guidelines for GLOF risk reduction, which is one of the reasons the project has integrated corresponding Outputs into its design. Existing Environmental Impact Assessment guidelines, building codes, land use planning and zoning regulations, and risk assessment guidelines in the Gilgit-Baltistan and Chitral areas have yet to incorporate the dimension of GLOF risk. The proposed project will be the vehicle to undertake this task.

F. DESCRIBE IF THERE IS **DUPLICATION OF THE PROJECT** WITH OTHER FUNDING SOURCES, IF ANY.

At present, there is no major national level project in Pakistan which exclusively addresses the need for ground-level work on GLOF risk reduction. During the formulation phase of the proposed project, inputs from the UNDP/DIPECHO-funded "Regional GLOF Risk Reduction Project" have been analyzed and incorporated into the project document. The focus of this regional project is on comparative risk analysis and regional knowledge exchange, and is thus expected to complement Component 4 of the proposed project; While the regional GLOF Risk Reduction project has a limited financial scope of 295,000 Euro (spread over 4 countries), the proposed project is expected to go beyond comparative analysis and work on a much more concrete technical scale.

Some surveys have been conducted to assess basic GLOF hazards in the Indus River Basin, but there has been limited progress on the establishment of a comprehensive GLOF risk assessment. The World Wide Fund for Nature (WWF), ICIMOD and the World Conservation Union (IUCN) have conducted initial hazard mapping exercises in the Gilgit-Baltistan districts, which provide part of the scientific foundation for this project. A DIPECHO/UNDP-funded regional project on climate risk reduction has carried out a detailed risk assessment and community based survey for GLOF risk in the Hunza River basin. With the exception of these initial efforts, and a regional ICIMOD study (2010) which was integrated into the formulation of this project document, there is no finer-grained risk and hazard analysis in mountain valleys which have been characterized as potentially hazard-prone.

At the level of institutional cooperation, the regional DIPECHO/UNDP-funded GLOF risk reduction project has facilitated first interregional exchanges between research institutions dealing with GLOF risk analysis, but there is a need to institutionalize these linkages much better operationally, with a view of supporting concrete risk reduction measures at the community level.

Ongoing DRM projects aim predominantly at community preparedness in the event of likely hazard occurrences. The specific needs of communities vulnerable to GLOF hazards are not covered under these projects. The already on-going One – UN Joint Programme on Disaster Risk Management has gathered experience devising systems for seasonal flood forecasting: A Sustainable Land Management project (SLMP) has initiated a small-scale project with the Pakistan Meteorological Department (PMD) for the upgrading of a seasonal flood early warning

system. The existing Early Warning System needs to be up-graded and a training programme is required for communities to operate such a system effectively.

Even after comprehensive analysis of other regional GLOF-related interventions with a link to Pakistan, the risk of duplication can be assessed as negligible. Financing from the Adaptation Fund will therefore enable the implementation of Pakistan's first tangible, community- and evidence-based GLOF risk reduction effort.

G. IF APPLICABLE, DESCRIBE THE LEARNING AND KNOWLEDGE MANAGEMENT COMPONENT TO CAPTURE AND DISSEMINATE LESSONS LEARNED.

Knowledge Management is a central component of the proposed project, which relates to very concrete technical as well as analytical activities. While Components 2 and 3 create analytical and technical know-how on vulnerability assessment and risk prevention measures, Component 1 anchors and disseminates this knowledge at the policy level. Component 4, which is aimed at replication and upscaling of project knowledge, disseminates this know-how beyond the policy level and connects the project with the 'club' of GLOF risk reduction projects that are already under way in china, India, Nepal and Bhutan..

As described in Section A of this project document, the project will develop a locally institutionalized knowledge base and analytical framework for long-term tracking and management of GLOF risks in Pakistan. Networking with global and regional research and resource centres working on GLOF issues will be established to institutionalize a well connected knowledge base and analytical framework for decision-making.

A communication strategy for the project will be developed, which will highlight dissemination of project experiences to communities, educational institutions, NGOs, Civil Society Organizations, private sector institutions with a stake in the issue, and the larger public. This strategy will detail the use of print and electronic media and other communication channels (roundtables, participative community workshops, posters, brochures, booklets, pamphlets, news articles, radio and TV broadcasts, and web-based items).

Technical knowledge and lessons in the artificial lowering of glacier lake levels, as well as the stabilizing of slopes, moraine dams and drainage channels, will be systematically captured and documented for future use. Lessons learnt from the project will be provided via a number of national, regional and international communication channels to increase their outreach (including radio and TV news pieces). This will enable adoption of project experiences in the up-scaling of early warning systems outside of the immediate project area, and benefit other disaster-prone areas downstream of potentially hazardous glacier lakes.

H. DESCRIBE THE CONSULTATIVE PROCESS, INCLUDING THE LIST OF **STAKEHOLDERS** CONSULTED, UNDERTAKEN DURING PROJECT PREPARATION.

This project was prepared using inputs from a number of stakeholders, including non-environmental agencies that are working in GLOF-prone areas. Consultations were held with the Ministry of Environment and GCISC in order the discuss the project concept and the potential project sites. Subsequently, other relevant government departments were consulted. The communities in Gilgit-Baltistan and Chitral were also involved in the stakeholders

consultations and community representatives participated in the discussions. The project design, criteria for potential sites and site selection was done with the stakeholders. These stakeholders will be the main partners of the full-size project.

Stakeholder Involvement Plan	
Agency Name	**Role in the Project**
Ministry of Environment	Ministry of Environment has taken the lead in designing and implementing the National Environment Action Plan. This Ministry will play a lead role in the implementation of this project. The Ministry of Environment is also hostingthe Designated National Authority (DNA) for the Adaptation Fund.
Pakistan Meteorological Department	The Pakistan Meteorological Department will work closely with the project team and provide guidance and support in the establishment of an Early Warning System (EWS)
Global Change Impact Study Centre (GCISC)	GCISC will provide overall policy guidance and technical assistance on the impacts of climate change in Northern Pakistan, with specific reference to GLOF risk assessment.
Pakistan Council of Research on Water Resources (PCRWR)	PCRWR will provide technical assistance and information about the glacial lakes in the project areas.
Earthquake Relief and Rehabilitation Authority (ERRA)	ERRA will help in incorporating GLOF risk reduction measures in national disaster management framework and plans.
Federal Flood Commission	The Federal Flood Commission (FFC) is responsible for establishment of a country-wide, integrated flood response management system. The project implementation team will work closely with the FFC to integrate GLOF risk considerations into national policies and strategies.
Institute of Geographical Information Systems (IGIS)	The Institute of Geographical Information Systems will help in generating maps of the project areas and help in acquiring the satellite imageries of the project sites.
ICIMOD	ICIMOD will work closely with the project management team on knowledge management matters. It will facilitate regional exchange of project experiences and help in designing capacity development elements of the project.
World Wide Fund for Nature (WWF)	The World Wide Fund for Nature will work with the project team and help in organizing the communities and sensitize community organizations.
Lead – Pakistan	Lead – Pakistan will work with the project implementers in designing and delivering

	training programmes on GLOF risk reduction.
IUCN	IUCN – Pakistan sub-offices in project areas will help in organizing communities and provide information about the community based organizations and their activities.
Karakoram University	The Karakoram University situated in Gilgit will help in technical scientific aspects of the project. The climate risk reduction measures could be integrated into the environmental curriculum.
Communities in the target areas	Local communities in Bagrot and Drongagh valleys are the direct beneficiaries of the project. They will be actively involved in any planning, implementation and analysis functions performed by the project.
District government in the target areas	All district level administration offices involved in the project will work closely with GBDMA and DDMA in the districts where the project activities will be implemented.
Provincial authorities in the target areas	The provincial level administration offices will work closely with the GBDMA and DDMA for the project activities and provide overall support and guidance.
UNDP	UNDP Pakistan Country Office will provide technical and financial implementation support and monitoring to the project. It will help mobilize and coordinate support from other partners (especially GLOF and DRR projects in the HKH region) through its global network.
Ministry of Foreign Affairs	The ministry will help in establishing international linkages of the project and emphasize policy recommendations.

The proposed project was prepared in cooperation between UNDP, the Regional Glacial Lake Outburst Floods Risk Reduction Initiative, ICIMOD, the National Agricultural Research Center, the Ministry of Food, NDMA-Pakistan, and the Pakistan Meteorological Department and local communities in Bagrot and Drongagh.

I. FUNDING JUSTIFICATION

Component 1: Policy recommendations & institutional strengthening to prevent climate change induced GLOF events in northern Pakistan

Baseline (without AF resources):

At present, decision-makers and disaster management planners at the national, provincial and district levels do not have sufficient knowledge to assess the consequences of growing GLOF risks on their constituencies. Although international organizations such as ICIMOD have carried

out regional GLOF risk assessments which indicate GLOF as a serious risk in northern Pakistan, the hot spots for GLOF risks at a finer resolution (especially at the level of individual communities in hazard-prone valleys) are not known. A regional, DIPECHO/UNDP-funded GLOF risk reduction project has undertaken a comparative analysis of GLOF experiences in 4 countries (India, Nepal, Pakistan, Bhutan), but doesn't provide the financial means to implement concrete risk reduction measures on the ground. With regards to requirements for GLOF Early Warning systems, applied knowledge to inform the population effectively and comprehensively about impending flooding hazards is clearly insufficient. Climate Change risks are mentioned in existing policies and disaster management frameworks, but no comprehensive guidelines exist at the district and local levels to deal with tangible vulnerabilities from particular large-scale flooding hazards. Consequently, district authorities are not fully equipped to incorporate long-term GLOF risk reduction into on-going and recurrent development planning activities. While Pakistan generally has capacity to respond to disasters after particular hazards have materialized (especially through deployment of military logistical capacities), the capacities for proactive and anticipatory disaster risk reduction are much less developed. Institutional mechanisms and policy instruments are not informed by evidence from risk reduction projects from the field, and likely to remain generic in the absence of concrete projects that can provide tangible evidence about hazard exposure, sensitivity and soft as well as hard measures to address these.

Adaptation alternative (with AF resources):

AF funding under Component 1 will be used to systematically integrate a dimension of GLOF risks into the decision-making processes, policies and plans of institutions that have a stake in avoiding human and material losses from natural hazards in northern Pakistan. An inter-agency working group will incorporate climate change risk management considerations into existing disaster management policy frameworks and provide policy notes to inform new risk management legislation. The existing National Disaster Risk Management Framework will be revised to incorporate climate risk and GLOF risks, and district authorities will have a comprehensive set of GLOF risk management guidelines available to reduce human and material losses in disaster-prone communities. AF resources will be used to compile a standardised glacial lake inventory of all glaciated regions in northern Pakistan, which is considered essential in view of the realisation that the potential for serious losses to glacial lake outburst is growing steadily. Such an inventory will be up-dated periodically, in alignment with activities financed under Component 2 of this project. Such a central database solution is considered highly practical, as it enables progressively inexpensive access to remotely sensed imagery and the use of more sophisticated methods for its analysis. Relevant government departments will be enabled to interpret the information available in such a database in support of policy, planning and investment objectives. Finally, AF resources will enable the integration of GLOF risk management into national, provincial and district development plans.

Component 2: Strengthening Knowledge and Information about GLOF risks in northern Pakistan

Baseline (without AF resources):

The knowledge about glacier lakes in Pakistan and their associated flooding patterns is limited. Some surveys have been conducted to assess basic GLOF hazards in the Indus River Basin, but there has been limited progress on the establishment of a comprehensive GLOF risk assessment. The World Wide Fund for Nature (WWF), ICIMOD and the World Conservation

Union (IUCN) have conducted initial hazard mapping exercises in the Gilgit-Baltistan districts, which provide part of the foundation for this project. A DIPECHO/UNDP-funded regional project on climate risk reduction has carried out a detailed risk assessment and community based survey for GLOF risk in the Hunza River basin. With the exception of these initial efforts, and a regional ICIMOD study (2010) which was integrated into the formulation of this project document, there is no finer-grained risk and hazard analysis in mountain valleys which have been characterized as potentially hazard-prone. Better hazard and vulnerability information is essential for better risk mapping, early warning and disaster prevention planning, but at present there are no comprehensive datasets that are sufficiently detailed to enable the planning and design of concrete GLOF risk reduction measures in a hazard-prone mountain valley downstream of a potentially hazardous glacier lake. The target areas of Bagrot and Drongagh have been characterized by ICIMOD as two of the mountain valleys which are most at risk from GLOF events, but finer-grained assessment information is still needed to characterize the level of the threat, the extent of the hazard, the communal assets at risk and the sensitivity of different livelihood groups to different levels of flooding threat. At the level of institutional cooperation, the regional DIPECHO/UNDP-funded GLOF risk reduction project has facilitated first interregional exchanges between research institutions dealing with GLOF risk analysis, but there is a need to institutionalize these linkages much better operationally, with a view of supporting concrete risk reduction measures at the community level.

Adaptation alternative (with AF resources):

AF resources will be dedicated to the application of remote sensing, which is the most effective first phase approach in GLOF risk reduction and preparedness. Potentially dangerous glacial lakes in northern Pakistan will be identified and prioritised for further investigation, and monitored on a continuing basis. High resolution time series satellite images will provide the means of achieving this economically. A list of the largest and most rapidly expanding lakes in northern Pakistan, which are also situated above areas of intensive human utilization, will be developed and made available to decision-makers at all planning levels (national, provincial, district). AF resources will finance detailed risk and hazard zonation maps in those mountain valleys that are defined as the most hazardous ones in terms of GLOF risk. A more complete assessment, which will require fieldwork and community-based assessment, will be conducted in Bagrot and Drongagh. This will include the application of geophysical techniques as well as an inventory of the vulnerability of human assets in the downstream area. Vulnerability maps will be prepared for both target sites, displaying households and infrastructure most at risk in terms of both exposure as well as structural integrity and sensitivity. Existing technical, natural, human and social capital that can be employed to reduce disaster risk will be assessed. Over-flight observations of the prioritised lakes and their immediate downstream areas will be utilized, if financially feasible. Building on these activities, AF resources will be used to address the urgent need for region-wide collaboration in the development of standardised approaches and, eventually, of uniform standards with regards to early warning and hazard mitigation. South-South collaboration will be facilitated for the sharing of know-how and experiences about GLOF risk management. Consideration will be given to link up professionals in the Himalaya Hindu Kush region with Andean professionals who have successfully tackled problems of GLOF risk assessment and mitigation in the Peruvian Andes. Lessons learnt from other GLOF projects in Bhutan, Nepal, China, India, Peru, Chile and European countries will be analyzed to define a catalogue of available know-how and technologies for GLOF risk reduction.

Component 3: Demonstration of community-based GLOF risk management in vulnerable mountain valleys of northern Pakistan

Baseline (without AF resources):

Existing flood early warning systems in the Bagrot and Drongagh valleys rely on telephones and messaging services. Once there is a flood, dissemination of warning messages is commonly based on informal and uncoordinated communication of telepphone messages, which leaves huge gaps in coverage. The current systems provide insufficient lead time for evacuation, and communities are ill prepared for the scope and dimension of flooding that are associated with GLOF events. At present, the Bagrot and Drongagh valleys do not have hazard sensors, relay stations for warning signals, or signaling devices that work together as a close coupled early warning system. No community focal points are trained in the operation and maintenance of early warning system components, and no GLOF evacuation areas have been identified. As a result, communities downstream of the glacier lakes are not able to receive and react to GLOF early warning messages in a timely and appropriate manner. In addition to insufficient EWS capacity, the government of Pakistan is unable, on its own, to bear the costs of reducing the threat of flooding from rising water levels in the glacier lakes associated with the Bagrot glacier in Giltgit-Baltistan and the Gohkir Glacier in Chitral (upstream of Drongagh). Although punctual monitoring of the stability of moraine dams at these sites is taking place, no structural measures have been implemented to reduce the risk of large-scale flashfloods to downstream communities.

Adaptation alternative (with AF resources):

Adaptation Fund resources will be used to enhance the resilience of the vulnerable population in Bagrot and Drongagh by establishing an early warning system for GLOF and other flash floods. Existing rudimentary early warning approaches will be up-graded with a technically sound system that is able to receive, trigger and relay early warning signals on a 24 hours basis. Community and NGO focal points will be trained to access, monitor and interpret data from sensor equipment installed by PMD at a number of local sites, and involved in the operation, maintenance and calibration of these systems. Based on the systematic capturing of hazard information and vulnerabilities in Component 2, awareness raising activities will be undertaken to educate disaster-prone communities about the nature of GLOF risks, the particular behavior of GLOF events, evacuation routes and early warning protocols. These awareness activities will be connected with the production and dissemination of communication products, such as posters, leaflets and videos illustrating the topic. Institutional arrangements to devise, operate, test, and maintain a community-based GLOF risk monitoring & early warning system will be established. An evidence base on the strengths and weaknesses of different types of high- and low-tech early warning systems will be created, which will enable replication in other vulnerable areas. In addition to the establishment of an Early Warning system, the project will implement concrete risk mitigation measures for the potentially hazardous glacier lakes associated with the Bagrot glacier in Giltgit-Baltistan, and the lakes associated with the Gohkir Glacier in Chitral (upstream of Drongagh). AF resources will be used to establish check dams, mini dams, spill-ways, slope stabilization and –reinforcement structures, and controlled drainage where feasible. These measures will reduce the gravity flow of water in times of flooding, conserve soil stability, and control lake levels by means of spillways or siphons. Slopes adjacent to glacier lakes will be stabilized, preventing landslides and rockfalls and thereby reducing the risk of compound disasters.

Existing knowledge from other GLOF risk management projects in Bhutan and Nepal will assist to prioritize measures.

Component 4: Documentation, analysis and continued application of lessons learnt

Baseline (without AF resources):

At present, there is a limited pool of knowledge and experience on how to involve communities in the design, implementation and maintenance of concrete GLOF risk reduction measures. While Pakistan has institutional mechanisms for knowledge sharing on disaster response, knowledge on pre-disaster risk management is yet to be developed and systematically disseminated.

The lack of community preparedness, especially with respect the need of training in first aid, search and rescue, community contgency planning, marking the flood basin to ensure proper land use planning is one aspect of disaster prepardness Capacity building and training programmes at te community level would reduce their dependency on government. The local community has yet not visualized the risk of GLOFs in many parts of the area. Inspite of the fact that repeated incidents of flash floods and the resultant damage have occurred, the risks of GLOF or flash flood events is still not being factored into the community level livlihood and occupational patterns. There is inadequate understanding of the capacity required to prepare for such events and to mitigate their impacts.

Adaptation alternative (with AF resources):

Building on participative processes initiated under Components 1 and 2 of the project, and drawing on the technical experiences in the establishment of early warning and risk mitigation measures under Component 3, Component 4 of the proposed project will enable the analysis, replication and upscaling of project experiences in other communities that are vulnerable to GLOF risks. Technical specifications and decision-making processes pertaining to the establishment of early warning and risk mitigation systems under the project will be captured and codified in a GLOF risk management manual. A dissemination campaign will be launched to present the findings from the project to relevant public entities and development partners, as well as other district entities with similar degrees of vulnerability. This campaign will integrate all vulnerable districts (based on the vulnerability maps generated under Outputs 1.2. and 2.2.) and facilitate the replication of the project approach in at least 2 other vulnerable districts. Exchange programmes between project sites, potential target sites and other GLOF risk management projects outside of Pakistan will promote learning and transfer of experience, both on a national as well as international basis. Other countries facing GLOF risks, such as China, India, Nepal and Bhutan, will thereby benefit from the knowledge generated through the project. In conjunction with GLOF risk management projects under way in Bhutan, India and China, the project will contribute to a critical mass of experience on GLOF risks in the Himalaya region and enhance systematic regional cooperation.

PART III: IMPLEMENTATION ARRANGEMENTS

A. Adequacy of project / programme management arrangements.

This project will be implemented by the Ministry of Environment, Government of Pakistan, in collaboration with the provincial governments of Khyber-Pakhtoonkhawa and Gilgit-Baltistan. A **Project Steering Committee** (PSC) will be established at the federal level which will provide strategic guidance for the implementation of the project. The PSC will be chaired by the Secretary, Ministry of Environment and the representatives from relevant departments, NGOs and community members. The composition and TORs of the Project Steering Committee are attached as Annex – I. Similarly, two **Project Management Committees** (PMCs) will be established at the provincial level for the smooth implementation of the project activities. These PMCs will be established in both Gilgit-Baltistan and Chitral. The composition and TORs of the Project Management Committees are attached as Annex – I. At the provincial levels of Gilgit-Baltistan and Khyber Pakhtoonkhawa, **provincial offices** will be established under the respective Planning and Development Departments. National and local NGOs such as ICIMOD, WWF, IUCN and LEAD – Pakistan and/or Government agencies/departments will be selected to lead the implementation of local level activities, based on a proposition by the Project Manager and approval by the PSC. These partners will work through community based organizations and ensure their sustainable participation during the planning, implementation and monitoring stages of the initiative.

The project team will be led by a National **Project Manager** who will be supported by the provincial teams in Gilgit and Chitral. The implementation arrangements and the representation in the PSCs and PMCs have been finalized after consultations with the local stakeholders. All main stakeholders are represented in PSC and PMCs.

B. Describe the measures for financial and project / programme risk management.

Key risks underlying the project have been analyzed and qualitatively assessed in connection with the context of the target sites for the project. Potential risks include:

- Adverse climatic conditions may damage adaptation measures being implemented;
- The political and security situation in pilot districts may affect project implementation or weaken the interest of stakeholders to address adaptation planning issues.
- Delays in recruitment of qualified project staff may affect the timeframe of different project activities.
- Project stakeholders may disagree on institutional mechanisms for project implementation and refrain from providing the necessary coordination.
- Government co-financing contributions may only come forth in batches and may not be available in full at the beginning of the project.
- Lack of incentives for particular local communities to cooperate in activities that do not yield immediate financial value, but aim at longer-term resilience, may reduce stakeholder engagement and comprehensive participation.
- Implementing partners for local level initiatives and pilot sites for project implementation may shift during project implementation, due to unforeseen (e.g. political) reasons.

Over the course of the project, a UNDP risk log will be regularly updated in intervals of no less than every six months in which critical risks to the project have been identified.

At the time of project formulation, strong political as well as financial commitment from national as well as provincial Government authorities is evident which will limit a number of risks from materializing. Consistent involvement of a diverse set of partners, including local government agencies/departments, NGOs and communities will further reduce these risks.

C. Monitoring and Evaluation

Project monitoring and evaluation (M&E) will be in accordance with established UNDP procedures and will carried out by the Project team, verified by the Ministry of Environment, Government of Pakistan and the UNDP Country Office in Islamabad. Dedicated support by the technical adaptation teams in the UNDP Regional Center for Asia/Pacific and UNDP New York will be provided on a regular basis. A comprehensive Results Framework of the project will defines execution indicators for project implementation as well as the respective means of verification. A Monitoring and Evaluation system for the project will be established based on these indicators and means of verification. Targeted M&E activities for the proposed project include the following:

A **Project Inception Workshop** will be conducted within four months of project start up with the full project team, relevant government counterparts, co-financing partners, and UNDP. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan. A fundamental objective of the Inception Workshop will be to present the modalities of project implementation and execution, document mutual agreement for the proposed executive arrangements amongst stakeholders, and assist the project team to understand and take ownership of the project's goals and objectives. Another key objective of the Inception Workshop is to introduce the project team which will support the project during its implementation. An Inception Workshop Report will be prepared and shared with participants to formalize various agreements decided during the meeting.

A UNDP **risk log** will be regularly updated in intervals of no less than every six months in which critical risks to the project have been identified. **Quarterly Progress Reports** will be prepared by the Project team and verified by the Project Steering Committee. **Annual Project Reports** will be prepared to monitor progress made since project start and in particular for the previous reporting period. These annual reports include, but are not limited to, reporting on the following:

- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative);
- Project outputs delivered per project Outcome (annual);
- Lessons learned/good practices;
- Annual expenditure reports;
- Reporting on project risk management.

Government authorities, members of Steering Committees and UNDP staff will conduct regular **field visits** to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress.

In terms of financial monitoring, the project team will provide UNDP with **certified periodic financial statements,** and with an **annual audit** of the financial statements relating to the

status of funds according to the established procedures set out in the Programming and Finance manuals. The Audit will be conducted by a legally recognized auditor of the Government, or by a commercial auditor engaged by the Government.

The project will undergo an independent **Mid-Term Evaluation (MTE)** at the mid-point of project implementation, which will determine progress being made toward the achievement of outcomes and identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. A, summative **TerminalEvaluation** will be conducted 3 months before project closure.

The budgeted Monitoring & Evaluation plan is as follows:

Type of M&E activity	**Responsible Parties**	**Budget US$** *Excluding project team Staff time*	**Time frame**
Inception Workshop (IW)	▪ National Project Coordinator ▪ UNDP CO	4,000	Within first 6 months of project start up
Inception Report	▪ Project Team ▪ UNDP CO	None	Within 1 month of IW
Measurement of Means of Verification for project indicators	National Project Coordinator	None	Start, mid and end of project
Annual and Quarterly Progress reviews	▪ Project Team ▪ UNDP-CO	None	Quarterly and Annually
National and Provincial Steering Committee Meetings	▪ National Project Coordinator ▪ UNDP CO	10,000	Following Project IW and subsequently at least once a year
Periodic status reports	▪ Project team	4,000	To be determined by Project team and UNDP
Technical reports	▪ Project team ▪ Hired consultants as needed	8,000	To be determined by Project Team and UNDP
Mid-term External Evaluation	▪ Project team ▪ UNDP- CO ▪ External Consultants (i.e. evaluation team)	20,000	At mid-point of project implementation.
Terminal Report	▪ Project team ▪ UNDP-CO ▪ External Consultant	none	At least 1 month before the end of the project
Audit	▪ UNDP-CO ▪ Project team	8,000	Yearly
Visits to field sites	▪ Project staff ▪ Government representatives	40,000	At all stages of project implementation
Final Evaluation	▪ Independent external Consultants	20,000	six months prior to the terminal tripartite review meeting.
TOTAL indicative COST		**US$ 114,000**	

D. Project Logical Framework Analysis

A detailed logical framework, including Outcome Indicators, quantified Output targets, as well as specific, measurable and time-bound indicators is provided in Annex II.

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. RECORD OF ENDORSEMENT ON BEHALF OF THE GOVERNMENT The proposed project in line with Government of Pakistan's policies and priorities. Hence, it has been endorsed with the approval of competent authority. A copy of the endorsement letter is attached.

Momin Agha Deputy Secretary (Climate Change) & Designated Authority for the Adaptation Fund in Pakistan Ministry of Environment, Local Government Complex, G-5/2, Islamabad Tel: +92-51-9245529 Fax: +92-51-9245533 Email : momin agha@hotmail.com	Date: 22 October 2010

B. **IMPLEMENTING ENTITY CERTIFICATION**

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans and subject to the approval by the Adaptation Fund Board, understands that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
 Yannick Glemarec Director UNDP Environmental Finance	
Date:	Tel. & Email: +1-212-906-6843; yannick.glemarec@undp.org
Project Contact Person: Gernot Laganda, UNDP Regional Technical Advisor for Climate Change Adaptation	
Tel. & Email: +66 2288 2644; gernot.laganda@undp.org	

ANNEX I

Project Steering Committee (PSC):

A Project Steering Committee will be established to provide policy guidance to the project and monitor progress and performance. The PSC will facilitate inter-agency co-ordination of the project at the national level, provide avenues for maintaining inter-provincial linkages, and ensure that the lessons learned from implementation of the project are integrated into Pakistan's overall adatation programme. The Committee will be chaired by the Secretary, Ministry of Environment. Members will include ,UNDP, DG (Environment), Designated National Authority for Adaptation Fund, ICIMOD, Economic Affairs Division, Pakistan Metrological Department, Gilgit-Baltistan Disaster Management Authority, Chitral Disaster Management Authority, the Project Manager**,** the Inspector General of Forests General Manager, AKRSP, IUCN-Pakistan, WWF-Pakistan and community member representatives. The office of the National Project Manager's office will serve as the Secretariat to the Committee and will take responsibility for organising meetings, recording minutes and ensuring that decisions are implemented.

The frequency of PSC meetings will be decided by the Chair, but initially the Committee will be convened twice a year. The first PSC meeting each year will follow the preparation of a detailed Annual Project Report (APR) on implementation. The second PSC meeting will be convened during the middle of each year. PSC meetings will normally be convened in Islamabad.

The PSC will be responsible for the following activities:

- project review, monitoring and co-ordination;
- approval of annual work plan (including training and consultancies) and annual budget, including all components;
- co-ordination of government actions and provision of policy guidance;
- facilitating policy and legislative reform regarding management of GLOF as part of adaptation measures
- monitoring efforts to establish financial mechanism;
- ensuring adherence to UNDP guidelines for the administration of project funds; and
- ensuring linkages with the national environmental policies and adaptation plans.

Project Management Committees (PMCs)

The Project Management Committees will be formed in both Gilgit-Baltisan and Chitral to supervise project implementation, ensure that project targets are met, and monitor on-the-ground impacts.

In NAs, membership will be chaired by chief Gilgit-Baltistan Disaster Management Authority and Chief, Disaster Management Authority in Chirtal respectively. The membership will include the Regional Programme Manager, AKRSP, ICIMOD, WWF, a local representative each from IUCN, and WWF.

The Project Manager and a UNDP representative will also be members of both PMC's. The PMC's will meet at least twice a year at times and locations to be decided by the Chair. The Committees will be responsible for:

- monitoring the results of efforts to establish and strengthen GLOF related activities in the project sites;
- co-ordinating institutional arrangements for management of the activities;
- co-ordinating policy and legislative development regarding GLOF
- overseeing awareness and education activities;
- ensuring that partner agency programmes are fully integrated into the project framework;
- monitoring the results of the demonstration projects and supporting their integration into wider development programmes;
- monitoring technical assistance provided by the contracting agencies, including all institutional strengthening services provided to local communities and government bodies;
- monitoring all training activities;
- ensuring linkages to regional GLOF activities; and
- reviewing annual workplans

ANNEX II LOGICAL FRAMEWORK ANALYSIS

Project Strategy	Objectively verifiable indicators				
Goal	To enhance adaptive capacity to prevent climate change-induced GLOF disasters in Pakistan				
	Indicator	**Baseline**	**Target**	**Sources of verification**	**Risks and Assumptions**
Objective: To reduce climate change-induced risks of Glacial Lake Outburst Floods (GLOFs) in Gilgit Baltistan and Chitral	No. of potentially dangerous glacier lakes in Gilgit Baltistan and Chitral No. of institutions with increased capacity to minimize human and material losses from GLOF events Number of people living in Gilgit Baltistan and Chitral suffering losses from extreme weather events	There are 52 potentially dangerous lakes in Gilgit-Baltistan and Chitral areas. 35 destructive outburst floods are recorded in Gilgit-Baltistan and Chitral areas in last two hundred years.	The GLOF risk from at least 2 potentially dangerous glacier lakes in Gilgit Baltistan and Chitral is successfully reduced At least 80% of disaster management institututions in Gilgit Baltistan and Chitral (national, provincial and district level) are able to access, interpret and use GLOF risk information for planning purposes At least 2 GLOF-prone mountain valleys are comprehensively covered by a GLOF Early Warning system	Questionnaire-based surveys (QBS)/Interviews at the beginning, mid-term and end of the project Impact assessment at the end of the project Satellite imagery of glacier lakes and vulnerable sites before and after the project	The political situation stays stable throughout the project duration. Stakeholders are able to perceive reductions in vulnerability over the time-scale determined by project duration No flooding disasters in target communities occur throughout the project lifetime
Outcome 1: Strengthened Institutional capacities to implement policies, plans and investments that prevent human and material losses from GLOF events in	No. of targeted institutions with increased capacity to minimize exposure to GLOF risks Number of policies introduced to address GLOF risks or	National, provincial and local disaster management institutions and development planners are unable to design, finance and analyze GLOF risk reduction measures on the	By the end of Year 3, 100% of the national and 90% of district and community authorities in the Gilgit-Baltistan and Chitral regions are able to prioritize and plan measures to minimize potential losses from GLOFs • By the end of the project, at	QBS, training protocols and attendance lists	Government remains supportive to link longer-term climate change planning with current disaster risk management initiatives

	Indicator	Baseline	Target	Sources of verification	Risks and Assumptions
vulnerable areas of Northern Pakistan	adjusted to incorporate GLOF risks	basis of reliable, comprehensive information	least two policies have been reviewed and/or revised to adress or incorporate GLOF risk reduction	Review of climate change, DRM and development policies and plans at the national, district, and community levels	
Output 1.1: Policy framework and guidelines to address GLOF risks in northern Pakistan institutionalized	Number of policies introduced to address GLOF risks or adjusted to incorporate GLOF risks	Climate change risks are mentioned in the current Task Force on Climate Change (TFCC) report. No comprehensive disaster management guidelines exist for the Gilgit Baltistan and Chitral regions	• By the end of the project, a Disaster Management Act is formulated that incorporates GLOF and other climate risk issues • By the end of the project, existing DRM guidelines integrate longer-term climate risk planning	Review of Disaster Management Act, DRM policies, plans, and institutional structures	Government continues to support climate-resilient DRM.
Output 1.2: Indicators and criteria for GLOF vulnerability developed and systematically applied to enable priority allocation of risk reduction efforts and investments	Number of potentially GLOF-prone communities that are integrated in a centralized, web-based GLOF risk database Availability of a government action plan to address GLOF risks in Pakistan, starting from the highest risk zones and the most vulnerable	No comprehensive database and action plans exist for addressing GLOF risk in Pakistan.	• By year 1 of the project, all GLOF risk sites in Pakistan are identified and inventorized in a central, web-based GLOF risk database • By the end of the project, a comprehensive disaster risk reduction plan is available to address the biggest GLOF threats in the most vulnerable communities	GLOF risk database, Satellite imagery Action plan document	Turnover of staff does not counteract benefits of capacity building efforts

	Indicator	Baseline	Target	Sources of verification	Risks and Assumptions
	communities				
Outcome 2: Improved access of disaster management planners and policy makers to knowledge, information and research on GLOF risks	No. and type of government-led initiatives which conduct and update risk and vulnerability assessments	Level of knowledge about GLOF exposure and sensitivity in northern Pakistan is very limited.	• By the end of the project, 95 percent of population have sufficient knowledge about GLOF risks and mitigation measures.	QBS Surveys on communication channels	Continued government support for the project
Output 2.1: Systematic engagement of the project with global and regional research networks and centres working on GLOF issues	Number of specialized institutions actively connected in the exchange of relevant technical information that can inform GLOF vulnerability analysis and risk reduction planning	Regional platform established by the regional GLOF risk reduction project, with punctual interaction until the project has ended.	• By the end of year 2, at least 10 other GLOF risk reduction initiatives from other countries are analyzed to inform risk assessment and –planning under the proposed project	Comparative analysis report	Other GLOF projects have codified their lessons in an accessible format Relevant partners remain interested in cooperation
Output 2.2: Risk and hazard maps for mountain valleys with the highest GLOF risk and exposure of lives, livelihoods and infrastructure.	Number of GLOF hazard and vulnerability maps for GLOF-prone mountain valleys	No comprehensive risk and vulnerability maps for mountain valleys with highest GLOF risks available	• By year 1, all GLOF risk areas in Pakistan are covered by remote sensing information • By year 2, at least 2 GLOF-prone mountain valleys are analyzed by a detailed hazard zonation and vulnerability assessment.	Hazard maps Vulnerability maps Risk maps	Availability of field staff to conduct vulnerability assessment Availability of unrestricted satellite imagery No natural disasters in project area

	Indicator	Baseline	Target	Sources of verification	Risks and Assumptions
Outcome 3: Reduced human and material losses in vulnerable communities in the Northern areas of Pakistan through GLOF early warnings and other adaptation measures	Number of vulnerable households in Bagrot in Gilgit-Baltistan and Drongagh valley in Chitra covered by a GLOFearly warning system No. of physical assets strengthened or constructed to withstand or mitigate the effects of GLOF events	No GLOF early warning system for Bagrot and Drongagh Valley in place Vulnerable households are not able to receive and react to GLOF early warning messages No physical structures in place to mitigate the effect of GLOF events.	• By the end of the project, 90% of households in target communities are able to receive and respond to early warnings and take the appropriate actions following the warning. • By the end of the project, at least 2 targeted engineering structures (biological and/or mechanical) have been established to reduce the effects of GLOF events on livelihood assets	QBS with households Site visits before/after the project	No tampering with early warning system installations Community workforce available to support engineering measures
Output 3.1: Preparedness actions for vulnerable communities conducted to reduce risks from GLOF events	Percentage of targeted population aware of GLOF impacts and appropriate responses to the threat	Limited awareness by vulnerable communities in the Gilgit-Baltistan and Chitral valleys on GLOF risks and risk reduction measures	• By the end of the project, at least 90% of households in the target area are aware of the functionality of the GLOF EWS and able to respond to warning signals • By the end of the project, at least 2 full-scale GLOF early warning drills have been conducted, involving all households in the target communities	QBS Video of mock drills, simulation protocol Debriefing notes	Messages are delivered in an appropriate way to enhance awareness, receptiveness and understanding Messages are delivered in a concerted, coordinated and consistent manner
Output 3.2: A community based system for GLOF risk monitoring & early warning in priority	Number of households in Bagrot and Drongagh valley reached by a GLOF early warning system	No GLOF early warning system for Bagrot and Drongagh valleys in place.	• By the end of the project, 90% of households in each target valley are able to receive and respond to GLOF early warning signals and take the appropriate actions	QBS with households Mock drill protocols Field visits to EWS sensor, relay and	No tempering with the early warning system installations, Functioning backup systems in place.

	Indicator	Baseline	Target	Sources of verification	Risks and Assumptions
communities.	Percentage of households receiving and responding to warnings in time to avoid human losses.	Vulnerable households are not able to receive and react to GLOF early warning messages .	following the warning. • By the end of the project , at least 2 CBOs are trained in the operation and maintenance of the EWS and ensure its continued functionality	communication sites	
Output 3.3: Targeted GLOF risk reduction measures such as check dams, spill-ways, slope stabilization or controlled drainage established in Bagrot and Drongagh valleys	No. of physical assets strengthened or constructed to withstand or mitigate the effects of GLOF events	No risk reduction measures for GLOF in place in the target sites	• By the end of the project, concrete engineering measures are in place to reduce the impact of GLOF events on vulnerable communities in each target valley (as appropriate: check dams, mini dams, ponds, spill ways, slope stabilization, tree plantation, controlled drainage)	Field visits to engineering structures	Communities are receptive to the adoption of mitigation measures and participate actively in construction efforts. EIA yields positive result for the mitigation measures under consideration
Outcome 4: Project experiences documented and replicated	Number of proposals, papers, and other documents that incorporate learning from the project	Experiences regarding climate change-induced GLOF mitigation and preparedness in Pakistan have not been systematically captured and shared	• By the end of the project, at least 2 other GLOF mitigation and early warning initiatives or studies draw on learning from experiences in Pakistan.	Proposals, papers, and other documents referring to AF-funded GLOF project in Pakistan	Political circumstances in Pakistan are conducive for international exchange on GLOF mitigation and preparedness efforts
Output 4.1. Technical knowledge and project lessons documented for use	Number of technical documents capturing project knowledge	No technical papers capturing project knowledge available	• By the end of the project, all technical decisions and lessons are captured in dedicated reports	Technical briefs prepared by the project	Technical knowledge is consistently codified and reflected upon over the lifetime of

	Indicator	Baseline	Target	Sources of verification	Risks and Assumptions
in future initiatives			• By the end of the project, a GLOF risk reduction manual is available and disseminated both nationally and internationally • By the end of the project, a project website is established and linked to the GLOF risk database developed under Outcome 1	Manual Project website	the project
Output 4.2. Project experiences disseminated to policy makers ad disaster management planners in Pakistan and the wider HKH region.	Number of organizations actively involved in knowledge transfer within and across district borders Number of policy makers and disaster management practitioners within and outside of Pakistan who are aware of the project and willing to adopt lessons learned	No systematic knowledge transfer on GLOF risks from Pakistan to other countries	• By the end of the project, at least 1 international exchange visit between GLOF risk reduction projects has taken place • By the end of the project, DRM planning authorities of at least 3 GLOF-prone districts in Pakistan visit the target sites with a view on replication of the project approach in other vulnerable sites • By the end of the project, at least 2 project issemination workshops have been conducted in Pakistan, with attendance by stakeholders from all GLOF-prone districts	Study visit report Site visits, consultation protocols Workshop proceedings	Other regions and countries believe experiences from the project will be valuable for future GLOF mitigation and preparedness initiatives Project is sufficiently visible to other GLOF-prone districts Project is able to mobilize follow-up financing for replication and upscaling

ANNEX III

Project Budget

Award ID:	**TBC after AFB approval**
Project ID:	**TBC after AFB approval**
Business unit	**UNDP/GEF**
Project title:	**Reducing Risks and Vulnerabilities from Glacier Lake Outburst Floods in Northern Pakistan**
Implementing partner	Ministry of Environment

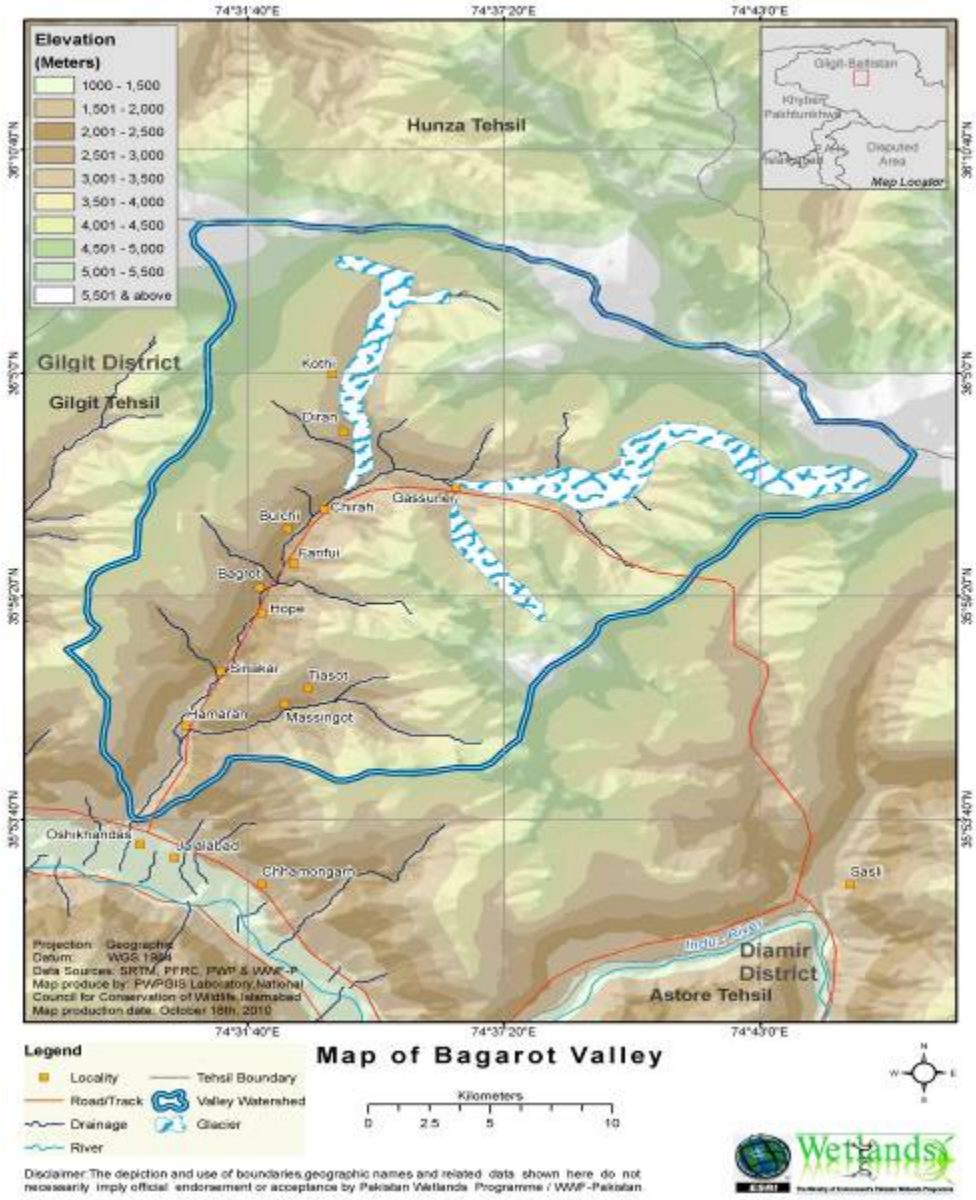
Project Outcome/Atlas Activity	Responsible party/ implementing agent	Donor name	Budget description	Total (USD)
OUTCOME 1: Policy Recommendations and institutional strengthening to prevent climate change induced GLOF events in Northern Pakistan				
Output 1.1 Policy framework and guidelines for to address GLOF risks in Northern Pakistan Institutionalized.	**MoE**	**Adaption Fund**	Travel	12,000
			Stakeholder Consultations	23,500
			Technical assistance	15,750
			Supplies	7,000
			Misc	15,000
Output 1.2 Indicators and criteria for GLOF vulnerability developed and systematically applied to enable priority allocation of risk reduction efforts and investments.			Travel	12,000
			Technical assistance	8,525
			Printing and publication	6,225
			Sub Total AF	**100,000**
OUTCOME 2: Strengthening knowledge and information about GLOF risks in Northern Pakistan.				
Output 2.1 Systematic engagement with global and regional research networks and centers working on GLOF issues.	**MoE**	**Adaptation Fund**	Travel	26,000
			Technical Assistance	30,000
			Communications	13,000
			Printing & Publication	11,500

Project Outcome/Atlas Activity	Responsible party/ implementing agent	Donor name	Budget description	Total (USD)
Output 2.2 Risk and hazard maps for mountain valleys with the highest GLOF risk and exposure of lives, livelihood and infrastructure			Technical Assistance	30,000
			Travel	19,000
			Sub-contracts (Out-sourcing)	26,000
			Communications	29,500
			Misc	8,500
Output 2.3 Web based GLOF risk information for Northern Pakistan.			Sub-contracts (Out-sourcing)	31,000
			Printing and publications	12,500
			Misc	13,000
			Sub Total AF	**250,000**
OUTCOME 3: Demonstration of community based GLOF risk management in vulnerable mountain valleys of Northern Pakistan				
Output 3.1 Awareness raising activities for vulnerable communities to climate related GLOF risks and appropriate preparedness and risk reduction measures	**MoE**	**Adaptation Fund**	Contractual Services	70,000
			Travel	55,000
			Technical Assistance	80,000
			Printing and publication	20,000
			Misc	10,000
Output 3.2 A community based system of GLOF risk monitoring and early warning established and piloted on priority communities.			Contractual Services	90,000
			Technical Assistance	80,000
			Materials & Goods	305,000
			Equipment	515,000
			Communications	85,000
			Travel	92,000
			Misc	10,000
Output 3.3 Targeted GLOF risk reduction measures such as check dams, spillways, slope stabilization for controlled drainage demonstrated in two dangerous GLOF sites.			Contractual Services	230,000
			Travel	150,000
			Equipment	468,000
			Materials and goods	425,000

Project Outcome/Atlas Activity	Responsible party/ implementing agent	Donor name	Budget description	Total (USD)
			IT equipment	80,000
			Misc	25,000
			Sub Total AF	**2,790,000**
OUTCOME 4: Documentation analysis and continued application of lessons learnt				
Output 4.1 Technical knowledge and Project lessons documented for use in Future initiatives.	**MoE**	**Adaptation Fund**	Travel	10,000
			Communications	10,000
			Contractual Services	15,000
			Printing and publication	10,000
Output 4.2 Project experiences disseminated to policy makers and disaster management Planners in Pakistan and the wider HKH region.			Consultation, workshops	15,000
			Travel	10,000
			Contractual Services	10,000
			Communications	15,000
			Misc	5,000
			Sub Total AF	**100,000**
Project/Programme Execution				
Project Management		**Adaptation Fund**	Monitoring & Evaluation Costs	**114,000**
			Contractual Services (Project Management & Administration)	**170,000**
			Travel	**50,000**
			Supplies	**26,000**
			Sub Total AF	**360,000**
TOTAL				**3,600,000**

ANNEX IV

Project Location



Disclaimer The depiction and use of boundaries,geographic names and related data shown here do not necessarily imply official endorsement or acceptance by Pakistan Wetlands Programme / WWF-Pakistan

Topographic Map of Drongagh Area, District Chitral

Disclaimer :The depiction and use of boundaries , geographic names and related data shown here do not necessarily imply official endorsement or acceptance by Pakistan Wetlands Programme / WWF-Pakistan.

ANNEX V

UNDP Environmental Finance – Specialized Technical Services

Stage	Specialized Technical Services Provided
Identification, Sourcing and Screening of Ideas	Provide information on substantive issues and specialized funding opportunities (SOFs)
	Verify soundness and potential eligibility of identified idea
Feasibility Assessment / Due Diligence Review	Technical support: provide up-front guidance; sourcing of technical expertise; verification of technical reports and project conceptualization; guidance on SOF expectations and requirements
	Provide detailed screening against technical, financial, social and risk criteria and provide statement of likely eligibility against identified SOF
	Assist in identifying technical partners; Validate partner technical abilities.
	Obtain clearances – SOF
Development & Preparation	Technical support, backstopping and troubleshooting
	Technical support: sourcing of technical expertise; verification of technical reports and project conceptualization; guidance on SOF expectations and requirements
	Verify technical soundness, quality of preparation, and match with SOF expectations
	Negotiate and obtain clearances by SOF
	Respond to information requests, arrange revisions etc.
	Verify technical soundness, quality of preparation, and match with SOF expectations
Implementation	Technical and SOF Oversight and support
	Technical support in preparing TOR and verifying expertise for technical positions. Verification of technical validity / match with SOF expectations of inception report. Participate in Inception Workshop
	Technical information and support as needed
	Technical support, participation as necessary
	Advisory services as required
	Allocation of ASLs
	Technical support and troubleshooting, Support missions as necessary.
	Project visits – at least one technical support visit per year.
	Technical support, validation, quality assurance
	Return of unspent funds
Evaluation and Reporting	Technical support, progress monitoring, validation, quality assurance
	Technical support, participation as necessary

Stage	Specialized Technical Services Provided
	Technical support in preparing TOR and verifying expertise for technical positions. Verification of technical validity / match with SOF expectations of inception report. Participate in briefing / debriefing
	Technical analysis, compilation of lessons, validation of results
	Dissemination of technical findings

Service standards:

1. initial response to communication within 2 working days
2. full response to communication (with the exception of a response requiring travel) within 10 working days